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RELIABILITY RECORD FOR GASOLINE-ENGINE-DRIVEN FORK-LIFT TRUCK F--ETC(U)  
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**RELIABILITY RECORD FOR  
GASOLINE-ENGINE-DRIVEN FORK-LIFT TRUCK FAMILY**

**January 1971**

Prepared in accordance with AMCR-702-8 for  
U.S. ARMY MOBILITY EQUIPMENT COMMAND  
4300 GOODFELLOW BOULEVARD  
ST. LOUIS, MISSOURI 63120

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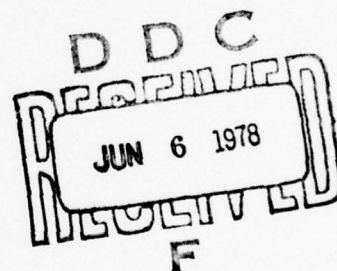
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**RELIABILITY RECORD  
FOR GASOLINE-ENGINE-DRIVEN  
FORK-LIFT TRUCK FAMILY**

Prepared in accordance with AMCR 702-8  
for U.S. Army Mobility Equipment Command  
4300 Goodfellow Boulevard  
St. Louis, Missouri 63120  
under Contract DAAK01-70-D-4142

January 1971



by  
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## FOREWORD

This document is one of three prepared under Contract DAAK01-70-D-4142, Delivery Order 0001:

Reliability Record for 6000-Pound Gasoline-Engine-Driven Fork-Lift Truck

Reliability Record for Gasoline-Engine-Driven Fork-Lift Truck Family

Failure Modes and Effects Analysis for Gasoline-Engine-Driven Fork-Lift Truck Family

These reports were the result of a six-month review and evaluation of fork-lift truck operation, including data collection and analysis.

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## RELIABILITY RECORD FOR GASOLINE-ENGINE-DRIVEN FORK-LIFT TRUCK FAMILY

### 1. PURPOSE

This record is a compilation of reliability information pertaining to the family of gasoline-engine-driven fork-lift trucks used in warehousing operations. The record serves as the primary management-control tool for the truck's reliability.

### 2. SCOPE

The reliability record includes:

- A general description of the gasoline-engine-driven fork-lift truck
- A general profile of functions that must be performed by the truck and its systems
- A description of a typical mission for the truck, indicating the percentages of time the various systems function during the mission
- A definition of "failure" in terms of its effects on the accomplishment of the mission
- A list of documents used in the preparation of this reliability record
- Reliability block diagrams depicting the relationships between the reliability of the truck and its major systems and subsystems/assemblies

### 3. DESCRIPTION OF THE TRUCK

The family of gasoline-engine-driven fork-lift trucks to which this reliability record applies consists of nontactical fork-lift trucks designed for handling and warehousing of materials. They are used for transporting loads from one area to another and for depositing and stacking loads, both indoors and outdoors. The trucks are self-contained rider-type and capable of handling loads up to 20,000 pounds, depending on the load rating of the particular truck. The load rating indicates the maximum load that the truck can lift when its load center (center of gravity) is 24 inches from the face of the forks at the specified lift height.

The truck is powered by an internal combustion, piston-driven engine usually equipped to eliminate radio interference. Materials handling is accomplished by a two-pronged fork on an upright boom lift powered for lifting and tilting by an engine-mounted hydraulic pump. (The hydraulic pump also serves the truck's power steering.) The boom can be tilted forward or backward (the maximum tilt varying with the model) as required by the nature of the load or operation. The speed of the truck is usually limited by an engine governor. An overhead guard is provided to protect the operator from falling objects.



Table 1 lists the manufacturers, Federal Stock Numbers, and descriptive data for the fork-lift trucks that were included in the sample from which the reliability data presented in this record were collected.

#### 4. DESCRIPTION OF SYSTEM FUNCTIONS

Seventeen systems are used in the truck family to perform various functions in the accomplishment of the mission; some models do not employ all the systems. The systems and brief descriptions of their functions are listed in Table 2.

#### 5. MISSION PROFILE

Use of the truck generally involves: starting the engine, allowing the engine to warm up by idling, performing several operating cycles, and then stopping the engine. This procedure is repeated numerous times during an eight-hour shift. An operating cycle consists of (a) a drive function, in which the truck moves toward and maneuvers in on a load; (b) a tilting/lifting function, in which the truck picks up the load (transmission in neutral position and the handbrake engaged); (c) a transport function, in which the truck transports the load to another position; and (d) a deposit function in which the truck deposits the load (again with the transmission in neutral position and the handbrake engaged).

Observation of operations at several Depot warehouses disclosed that a single warehousing operation (i.e., transferring one load from one point to another) does not typify the mission of the truck. The mission is more aptly described by a full day's operation, involving numerous starts and stops and the transporting of numerous loads of different weights over different distances. Therefore, the mission profile selected describes the operation of the truck throughout an eight-hour shift.

The initial segment of a typical shift is as follows: (a) the operator performs daily preventive-maintenance tasks, such as checking oil level, coolant level, battery condition, belt condition, and lights; (b) he starts the truck and allows it to idle until the engine reaches operating temperature, (c) he proceeds through several cycles of driving to, lifting, transporting, and depositing a load, (d) he stops the engine and "parks" the truck. Such an initial segment is illustrated in Figure 1a. In addition to the final stop at the end of the shift, the vehicle is stopped for a morning break, a meal break, an afternoon break, and an average of four other times for various reasons during the shift. Engine warm-up occurs only at the beginning of the shift and after the meal break. The typical complete shift described above is illustrated in Figure 1b.

The time values shown in Figure 1 were derived from field observations and examination of vehicle-use data covering 515 trucks over the period December 1968 to August 1970.\* In Table 3, the durations and frequencies of occurrence of the various functions are listed and converted to percentages of total operating time. The total operating time of 4.66 hours for the 8-hour mission was rounded to 5 hours in the subsequent reliability-assessment computations.

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\*The records were obtained at three Depots: The Atlanta Army Depot, Forest Park, Georgia; the Red River Army Depot, Texarkana, Texas; and the Defense General Supply Center, Richmond, Virginia.

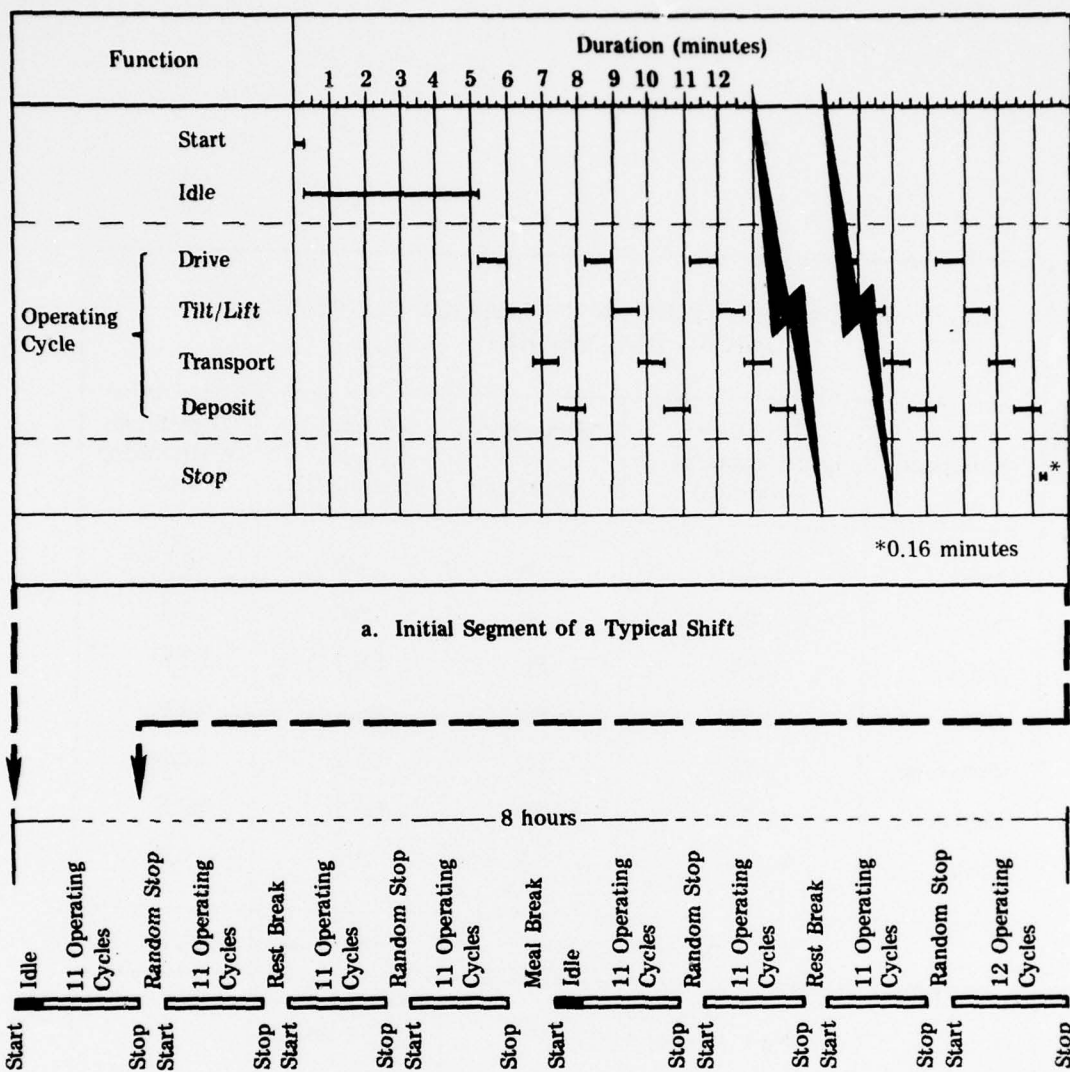
Table 1. DESCRIPTION OF GASOLINE-ENGINE-DRIVEN FORK-LIFT TRUCK FAMILY

Manufacturer	FSN	Capacity* (lbs.)	Lift Height (inches)	Type of Tires	Location Distribution		
					ATAD	RRAD	DGSC
Clark	3930-956-0094	4,000	144	Solid rubber			14
Minneapolis-Moline	3930-724-3570	4,000	144	Pneumatic		4	
Minneapolis-Moline	3930-064-5868	4,000	144	Pneumatic	3	25	
Minneapolis-Moline	3930-064-6564	4,000	144	Solid rubber	9		2
Yale & Towne	3930-271-1449	2,000	130	Solid rubber	1		5
Towmotor	3930-292-1100	6,000	127	Solid rubber			6
Towmotor	3930-292-1098	6,000	168	Solid rubber	3		
Clark	3930-542-2175	4,000	100	Solid rubber	7		
Clark	3930-542-2176	4,000	144	Solid rubber	10		
Baker	3930-738-5938	6,000	168	Pneumatic	5		2
Clark	3930-781-3857	2,000	100	Solid rubber	3		
Clark	3930-965-0093	4,000	100	Solid rubber			2
Clark	3930-915-0093	4,000	100	Solid rubber			2
Clark	3930-954-9311	4,000	100	Solid rubber	12	6	
Clark	3930-954-1303	4,000	144	Solid rubber	21	22	6
Allis Chalmers	3930-958-3684	6,000	168	Pneumatic	17	9	
Baker	3930-879-6870	6,000	168	Pneumatic			4
Minneapolis-Moline	3930-064-5869	6,000	168	Pneumatic			1
Towmotor	3930-781-3856	4,000	100	Solid rubber		5	1
Towmotor	3930-781-3855	4,000	144	Solid rubber	91	12	25
Towmotor	3930-073-9222	4,000	144	Pneumatic		8	
Service-Caster	3930-214-1025	4,000	180	Solid rubber	1		
Clark	3930-J02-2113	4,000	212	Solid rubber			1
Clark	3930-266-8955	4,000	144	Pneumatic			6
Towmotor	3930-P00-8120	3,000	130	Solid rubber		1	
Allis Chalmers	3930-203-2842	2,000	130	Pneumatic		3	
Clark	3930-203-2842	2,000	130	Pneumatic		3	
Clark	3930-266-8961	4,000	144	Solid rubber			1
Towmotor	3930-752-9464	4,000	144	Solid rubber		55	
Automatic Transportation	3930-679-4457	10,000	100	Solid rubber		3	
Hyster	3930-J28-0598	15,000	100	Pneumatic		1	
Hyster	3930-897-4632	15,000	210	Pneumatic	5	7	2
Clark	FSC-3930-NFN	20,000	210	Pneumatic		1	
Allis Chalmers	3930-1208-3242	5,000	144	Pneumatic		2	
Towmotor	3930-678-9917	4,000	100	Solid rubber			10
White	3930-P00-9608	4,000	100	Solid rubber		16	
White	3930-P00-9607	6,000	136	Pneumatic		15	
B.B. Lift Corporation	3930-209-2841	6,000	168	Pneumatic		1	
Gerlinger	3930-514-3477	15,000	210	Pneumatic		1	
Towmotor	3930-273-8225	4,000	144	Solid rubber			3
Yale	3930-214-1026	4,000	144	Solid rubber			5
Hyster	3930-238-4411	10,000	210	Pneumatic			1
Hyster	3930-038-4410	10,000	—	—		1	
Baker-York	3930-209-3242	6,000	—	—		1	
*Rated with 24" load center.				Total	188	202	99

**Table 2. FUNCTIONAL DESCRIPTIONS OF THE TRUCK's SYSTEMS**

Name	Functional Description
Engine System	Provides motive power for propelling the fork-lift truck and for driving accessory subsystems, such as the generator assembly, water pump, and hydraulic pump
Fuel System	Delivers fuel and air mixture to the engine proportional to the vehicle's power demand
Exhaust System	Transports the products of combustion away from the engine
Cooling System	Maintains a constant and uniform engine temperature
Electrical System	Generates, regulates, and delivers electrical power for engine ignition and operation of electrical subsystems
Transmission System	Transmits engine power and regulates the power torque/speed characteristic in response to vehicle demand and operator set point
Propeller System	Transmits motive power from the transmission to the differential
Front Axle System	Transmits motive power from the propeller shaft to the front wheels
Rear Axle System	Transmits steering force to the rear wheels
Brakes System	Reduces vehicle speed by converting vehicle kinetic energy to heat energy and holds vehicle immobile when stopped
Wheels System	Supports vehicle weight and provides for vehicle rolling motion and braking action
Steering System	Controls the direction of vehicle motion in response to operator set point
Frame System	Provides primary vehicle structural support for systems and operator
Body System	Provides enclosure for vehicle systems and operator
Suspension System	Dampen vibrations transmitted to operator and load during movement of vehicle
Clutch System	Permits engagement of transmission gearing to permit forward or reverse vehicle motion in response to operator signal
Hydraulic Lift System	Generates, regulates and delivers hydraulic power for lifting and tilting the load





**b. Typical Complete Shift (Mission)**

Total Operating Time	5 hours
Total Nonoperating Time	3 hours
Two 0.25-hour rest breaks	
One 1.00-hour meal break	
Four 0.375-hour random stops	
<b>Total Shift (Mission) Time</b>	<b>8 hours</b>

**Figure 1. MISSION PROFILE**



**Table 3. DISTRIBUTION OF TIME, BY FUNCTION,  
DURING ONE MISSION**

Function	Duration per Occurrence (minutes)	Frequency of Occurrence	Total Time (minutes)	Percentage of Operating Time
Start	0.25	8	2.0	0.7
Idle	5.00	2	10.0	3.6
Drive	0.75	89	66.7	23.8
Lift	0.75	89	66.7	23.8
Transport	0.75	89	66.7	23.8
Deposit	0.75	89	66.7	23.8
Stop	*0.16	8	1.3	0.5
Total Operating Time			280.1	100.00
Operating Time			**4.66 hours	
Non Operating Time			3.34 hours	
Mission Time			8.00 hours	
*Assumed value.				
**Rounded to 5 hours for the reliability-assessment computations.				

The number of cycles (loads moved) during the typical 8-hour shift was computed as follows:

given:                      Total start time = 2 minutes  
                                 Total idle time = 10 minutes  
                                 Total stop time = 1.3 minutes  
                                 Total operating time = 280.1 minutes (4.66 hours)  
                                 Drive/lift/transport/deposit cycle = 3 minutes

then

$$\begin{aligned} \text{Number of loads} &= \frac{t_{\text{op. time}} - (t_{\text{start}} + t_{\text{idle}} + t_{\text{stop}})}{(t_{\text{drive}} + t_{\text{lift}} + t_{\text{transport}} + t_{\text{deposit}})} \\ &= \frac{[280.1 - (2 + 10 + 1.3)]}{3} \\ &= 89 \end{aligned}$$

The mission-time profile was developed by use of the matrix presented in Appendix A.

The environment in which the truck works depends on the nature of the operation it supports. In the warehousing environment typical to the Continental United States (CONUS) — for which the vehicle is designed and in which our data were gathered — the vehicle generally drives and transports across relatively flat and smooth surfaces in a moderate temperature and humidity range. The aisle widths required by MIL-STD-268C for maneuvering the vehicle are shown in Table 4.

Table 4. AISLE-WIDTH REQUIREMENTS		
Capacity (lbs.)	Width in Feet	
	For Trucks With Solid Tires	For Trucks With Pneumatic Tires
2,000	10	12
4,000	12	15
6,000	14	18
8,000	14	20
10,000	—	22
15,000	—	25
20,000	—	28

The truck is designed to facilitate ready adjustment, servicing, or replacement of fan belt, ignition assemblies and parts, carburetor and components, fuel pump and components, oil filter and components, clutch, starter, generator, generator regulator, battery, wearing parts of the steering assembly, tires, wheels, lights, and horn. In a typical CONUS Army Depot, all such work is performed by the motor pool's maintenance shop (i.e., depot level of maintenance). Any maintenance at the user location is performed by a roving mechanic from this shop. Operators do not perform any maintenance.

## 6. FAILURE DEFINITION

There are no QMRS, SDRs, or specific performance specifications available from which established performance limits for the gasoline-engine-driven fork-lift truck might be extracted. Furthermore, the TAERS/TAMMS data that were collected for reliability analysis do not record instances of marginal performance detrimental to the mission. Consequently, it was not feasible to define failure in the quantitative terms of performance criteria. As the best alternative, failure was defined as *any incident that deadlines\* the vehicle during operation or that results in an unscheduled replacement or repair action.*

## 7. LIST OF DOCUMENTS USED

The following documents were used in preparing this reliability record:

- AMCR 702-8: Quality Assurance Reliability Record and Status Report
- TB-750-93-1: Functional Grouping Codes: Combat Tactical, and Support Vehicle and Special Purpose Equipment
- MIL-T-21870: Military Specification Trucks, Lift, Fork, Gasoline; General Specifications For
- TM 10-3930-622-14: Technical Manual Operation, Service, Maintenance Instructions or Truck, Fork, Lift, Gasoline Engine Driven, Pneumatic Rubber Tires. 6,000 Pound Capacity, Baker Model FJF-060, Army Model MHE-210

Additionally, several Technical Manuals containing listings of repair parts and special tools (-35P and -20P manuals) were used to identify parts, FSNs, and nomenclatures appearing on the maintenance-action forms from which the failure data were extracted.

## 8. RELIABILITY BLOCK DIAGRAMS

Reliability block diagrams for the family of gasoline-engine-driven fork-lift trucks are presented in Figures 2 through 20. Figure 2 is an overall reliability block diagram for the truck. Figure 3 is a function reliability diagram showing the systems that are required to operate to accomplish a given function and the relationships of the systems to one another. In all cases, the simple serial relationships are apparent. Each block is identified by the name of the system and contains (1) the Functional Grouping Code for the system, assigned in accordance with TB-250-93-1, (2) a space for inserting the probability, R, that the system will perform successfully for the time the vehicle operates in the specified function during the eight-hour mission, (3) the percentage, t, of the total operating time that the system operates in the specified function.

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\*Inoperative due to damage, malfunctioning, or necessary repairs.

Figures 4 through 20 are reliability block diagrams for the seventeen systems of the truck. These diagrams show the reliability relationship of the major subsystems/assemblies of each system and of the major components of each subsystem/assembly. The reliability relationships of the subsystems/assemblies are represented vertically to the left of the double line; those of the components of the subsystems/assemblies are represented horizontally to the right of the double line. In all cases, the simple serial relationships are apparent. Each block in the diagrams is identified by the name of the subsystem/assembly or component and contains (1) the Functional Group Code for the subsystem/assembly or component, (2) a space for inserting the failure rate,  $\lambda$ , in the case of the subsystem/assembly blocks and the failure rate itself in the case of the component blocks, and (3) the percentage,  $t$ , of the total operating time that the subsystem/assembly or component operates. A "phantom" component, with failure rate  $\lambda'$ , is included for each subsystem/assembly to account for the failures ascribed to the subsystem/assembly as a whole.

## 9. RELIABILITY CALCULATIONS

### 9.1 Basic Data

The failure rates for the components of the fork-lift truck family were based on data extracted from approximately 24,000 maintenance records covering the period from December 1968 through August 1970 on a truck sample size of 515. The data were analyzed by computer to determine total operating hours on each component, number of failures for each component, maintenance manhours and mean maintenance manhours for each component, and component reliability. Appendix B documents the results of this analysis in tabular form.

Table 1 of Section 3 listed the various trucks included in the sample. Table 5 shows the distribution of the sample by lifting capacity. The preponderance of the trucks were in the 4000-pound class and 6000-pound class. In this analysis, all the data collected from this

Table 5. CAPACITY DISTRIBUTION OF FORK-LIFT TRUCKS		
Capacity (lbs.)	Number of Trucks	Percent of Truck Inventory
2000	17	3.30
3000	1	.19
4000	406	78.83
5000	2	.39
6000	65	12.62
10000	6	1.17
15000	16	3.11
16000	1	.19
20000	1	.19
Total	515	100.00



sample population were used in calculating component failure rates. No attempt was made to evaluate the statistical correlation between component failure rate and such factors as truck capacity, truck age, depot location, and truck manufacturer.

## 9.2 Component Accumulated Hours

The Depot records disclosed that approximately 783,290 hours were accumulated by the 515 trucks during the period January 1969 to June 1970. Component accumulated times were determined by multiplying these hours by the percentage,  $t$ , of total time during the mission that each component was determined to operate. For example, the components of the engine assembly (Group Code 0100) were determined to operate in all functions except the stop function (see matrix in Appendix A), i.e., during 99.5 percent of the operating time. Therefore, accumulated time for the engine-assembly components =  $0.995 \times 783,290 = 779,374$  hours. Accumulated times for the other components of the truck were computed similarly, except for two deviations that were necessary for computing the hours for the generator and alternator assemblies. Very few trucks in the sample were equipped with alternators; the total hours for these trucks amounted to 3,051. Therefore, the accumulated time for the generator assembly and its associated parts was computed to be  $783,290 - 3,051 = 780,239$ .

## 9.3 Component Failure Rates

Component failure rates were computed simply by dividing the observed number of failures of the component by the accumulated hours. For example, for the Accessory Drive (Group Code 01005) of the Engine Assembly, 25 failures were recorded. Therefore:

$$\begin{aligned}\lambda_{01005} &= 25 \text{ failures}/779,374 \text{ hours} \\ &= 0.032 \times 10^{-3} \text{ failures/hour}\end{aligned}$$

The failure rate for components of which there is more than one in the subsystem/assembly represents the rate for that component group in the subsystem/assembly.

## 9.4 Component Reliability

The reliability (probability of completing the mission) of each component was computed as follows:

$$R_c = e^{-\lambda_c T_c}$$

where

- $R_c$  = component reliability
- $\lambda_c$  = component failure rate
- $T_c$  = component operating time during the mission  
= truck operating time during the mission  $\times t$

Therefore, for the Accessory Drive component:

$$\begin{aligned} R_{01005} &= e^{-\lambda_{01005} T_{01005}} \\ &= e^{-(0.032 \times 10^{-3}) \times 4.98} \\ &= 0.99984 \end{aligned}$$

### 9.5 Subsystem/Assembly Reliability

The failure rates for the subsystems/assemblies are not inserted on the reliability block diagrams because the components that comprise the subsystems/assemblies vary with the truck model. The reliability value may be computed either by (1) summing the failure rates of the constituent components (being sure to include the rate for the "phantom" component representing the failure ascribed to the subsystem/assembly as a whole — i.e.  $\lambda'$ ) and converting to a probability value by the exponential expression  $R = e^{-\lambda T}$ , or by (2) taking the product of the component reliabilities computed as described in Section 9.4 (again, being sure to include the reliability value —  $R'$  — for the "phantom" component). The latter method must be used when operating times for components within the subsystem/assembly differ. As an example of the second method, the computation for the Engine Assembly (group code 0100), assuming all of the components listed in the diagram, is as follows:

$$\begin{aligned} R_{0100} &= R'_{0100} \times R_{01001} \times R_{01002} \times \dots \times R_{01009} \\ &= 0.99930 \times 0.99991 \times 0.99925 \times \dots \times 0.99987 \\ &= 0.99710 \end{aligned}$$

### 9.6 System Reliability

The reliability for a given system is the product of the reliability values for the subsystems/assemblies comprising that system, as shown to the left of the double line in the system reliability block diagrams.

### 9.7 Function Reliability

The reliability of each of the truck's seven functions is the product of the probabilities that the systems required for that function will operate successfully in that function for the entire mission. This is expressed mathematically as follows (the start function is used for demonstration):

$$R_{\text{start}} = e^{-\lambda_{06} T_{06\text{start}}} \times e^{-\lambda_{01} T_{01\text{start}}} \times e^{-\lambda_{03} T_{03\text{start}}}$$

where

- $\lambda_{06}$  = Failure rate of the electrical system\*
- $\lambda_{01}$  = Failure rate of the engine system\*
- $\lambda_{03}$  = Failure rate of the fuel system\*

\*Summation of failure rates for the constituent components and the phantom component.

- $T_{06 \text{ start}}$  = Operating time of the electrical system in the start function  
 $T_{01 \text{ start}}$  = Operating time of the engine system in the start function  
 $T_{03 \text{ start}}$  = Operating time of the fuel system in the start function

## 9.8 Mission Reliability

The probability of the truck's completing the mission successfully, then, is the product of the seven function reliability values. This is expressed mathematically as follows:

$$R_{\text{mission}} = R_{\text{start}} \times R_{\text{idle}} \times R_{\text{drive}} \times R_{\text{lift}} \times R_{\text{transport}} \times R_{\text{deposit}} \times R_{\text{stop}}$$

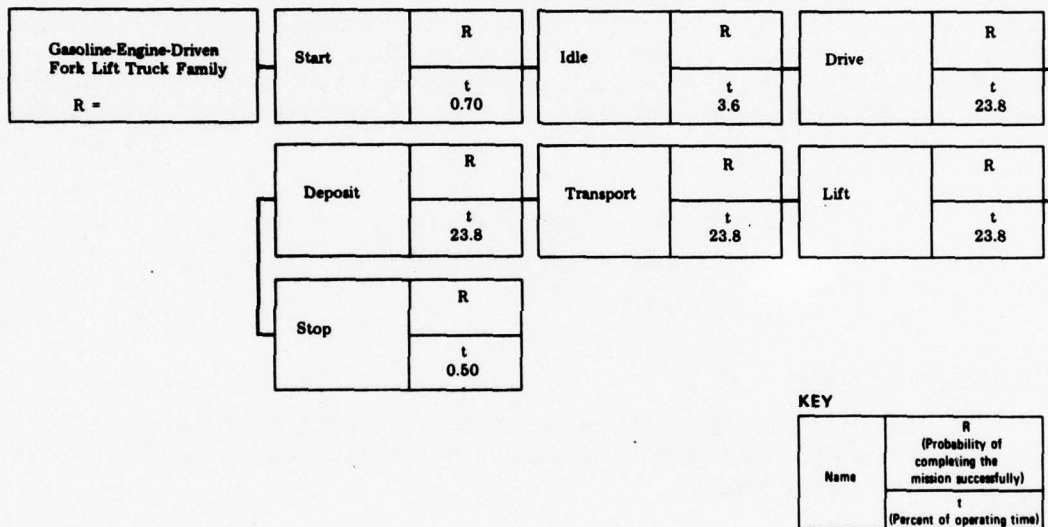


Figure 2. TRUCK RELIABILITY BLOCK DIAGRAM

FUNCTION

1. Start	Electrical System 06	R t .70	Engine System 01	R t .70	Fuel System 03	R t .70
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2. Idle	Engine System 01	R t 3.6	Electrical System 06	R t 3.6	Fuel System 03	R t 3.6	Cooling System 05	R t 3.6	Exhaust System 04	R t 3.6	Brakes System 12	R t 3.6
---------	---------------------	---------------	-------------------------	---------------	-------------------	---------------	----------------------	---------------	----------------------	---------------	---------------------	---------------

3. Drive	Engine System 01	R t 23.8	Fuel System 03	R t 23.8	Exhaust System 04	R t 23.8	Cooling System 05	R t 23.8	Electrical System 06	R t 23.8	Transmission System 07	R t 23.8
	Frame 15	R t 23.8	Steering System 14	R t 23.8	Brakes System 12	R t 23.8	Rear Axle 11	R t 23.8	Front Axle 10	R t 23.8	Propeller System 09	R t 23.8

4. Lift	Engine System 01	R t 23.8	Electrical System 06	R t 23.8	Fuel System 03	R t 23.8	Cooling System 05	R t 23.8	Exhaust System 04	R t 23.8
	Hydraulic System 24	R t 23.8	Brake System 12	R t 23.8	Body System 18	R t 23.8	Frame System 15	R t 23.8	Wheels 13	R t 23.8

KEY

Name	R (Probability of completing the mission successfully)	t (Percent of operating time)
------	---	----------------------------------

Figure 3 FUNCTION RELIABILITY BLOCK DIAGRAMS  
(Sheet 1 of 2)



Function

5. Transport

Engine System 01	R 23.8	Fuel System 03	R 23.8	Exhaust System 04	R 23.8	Cooling System 05	R 23.8	Electrical System 06	R 23.8
Brake System 12	t 23.8	Rear Axle Axle 11	R 23.8	Front Axle 10	R 23.8	Propeller System 09	R 23.8	Transmission System 07	t 23.8
Wheels 13	R 23.8	Steering System 14	R 23.8	Frame 15	R 23.8	Body 18	R 23.8	Hydraulic System 24	R 23.8
								Clutch System 25	R 23.8

6. Deposit

Engine System 01	R 23.8	Fuel System 03	R 23.8	Exhaust System 04	R 23.8	Cooling System 05	R 23.8	Electrical System 06	R 23.8
Hydraulic System 24	t 23.8	Body 18	R 23.8	Frame 15	R 23.8	Wheels 13	R 23.8	Brake System 12	t 23.8

7. Stop

Electrical System 06	R 23.8
	t .50

Figure 3. (Sheet 2 of 2)

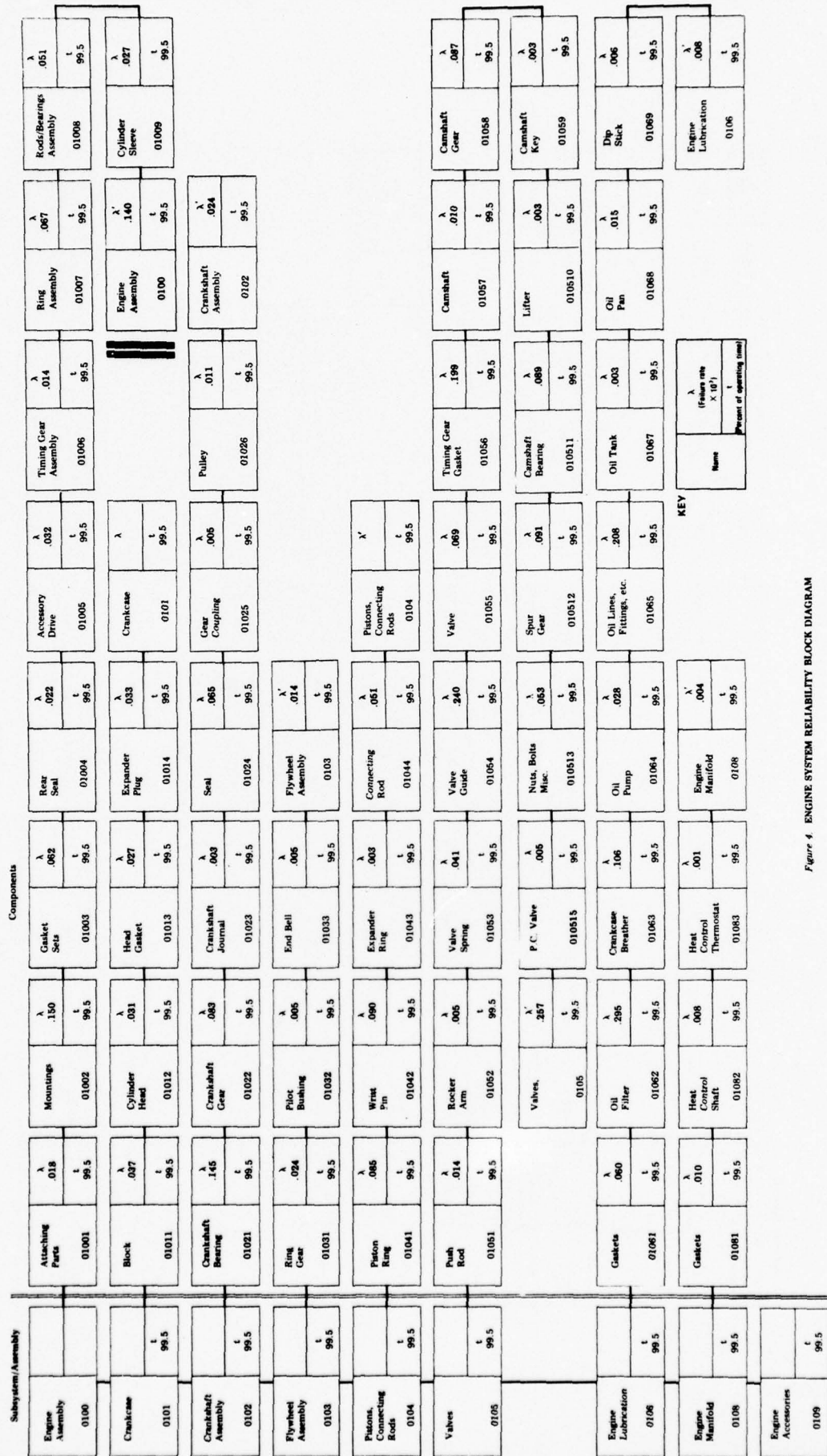


Figure 4. ENGINE SYSTEM RELIABILITY BLOCK DIAGRAM

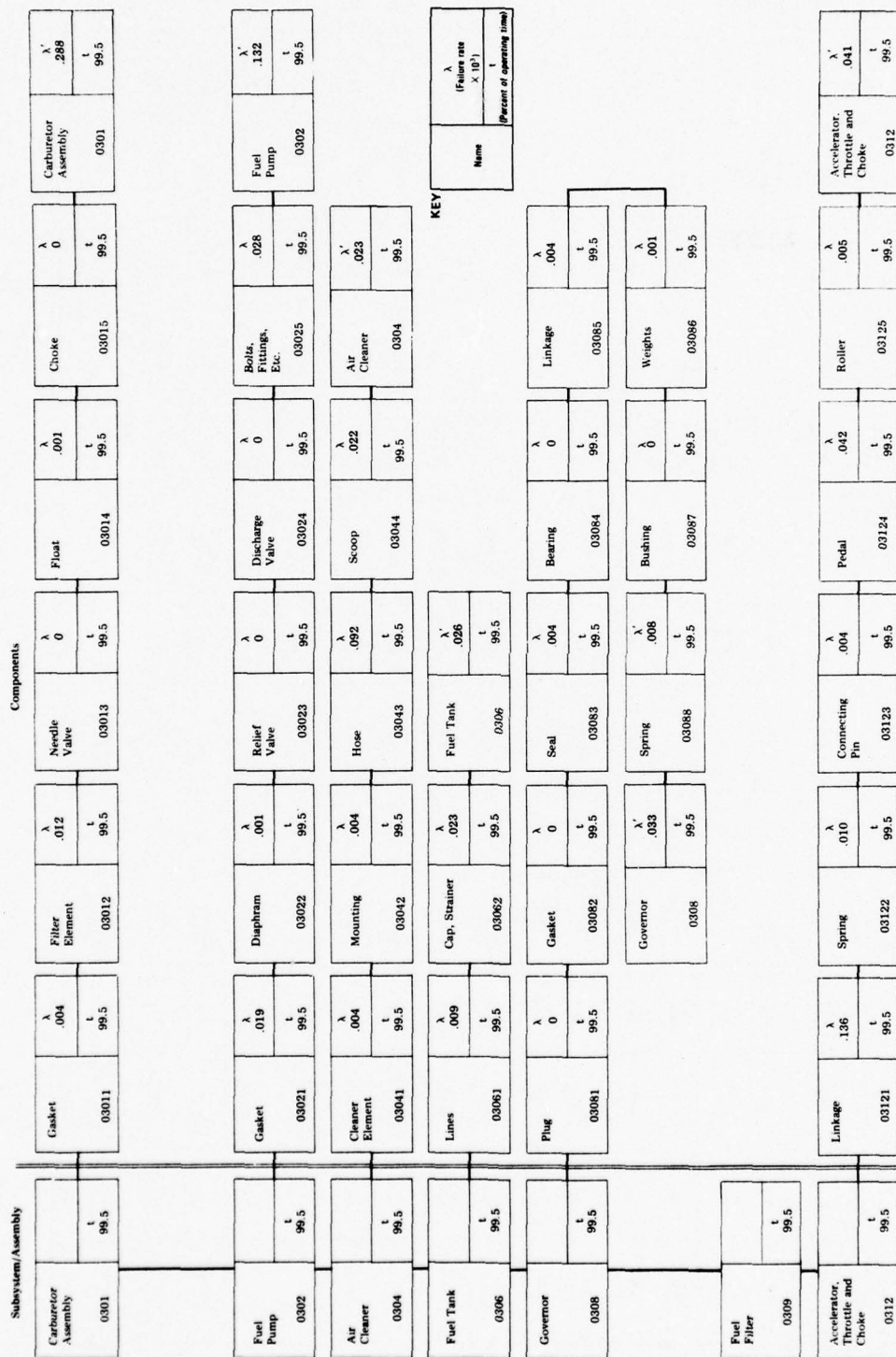


Figure 5. FUEL SYSTEM RELIABILITY BLOCK DIAGRAM

Subsystems/Assembly		Component												
Name	λ	t	Gasket 04011	λ .031 t 98.8	Muffler 04012	λ .063 t 98.8	Pipe 04013	λ .164 t 98.8	Elbow 04014	λ .013 t 98.8	Clamp 04015	λ .096 t 98.8	Fittings 04016	λ .019 t 98.8
Muffler and Pipe Assembly 0401		t 98.8												

Figure 6. EXHAUST SYSTEM RELIABILITY BLOCK DIAGRAM

Radiator Assembly 0501	t 98.8	Radiator Cap 05011	λ .036 t 98.8	Core 05012	λ .071 t 98.8	Overflow Pipe 05013	λ .022 t 98.8	Fittings 05014	λ .127 t 98.8	Radiator Assembly 0501	λ .401 t 98.8	Water Manifolds 0503	λ .001 t 98.8
Water Manifolds 0503	t 98.8	Fittings 05031	λ .022 t 98.8	Hose 05032	λ .324 t 98.8	Thermostat 05033	λ .034 t 98.8	Gasket 05034	λ .014 t 98.8	Thermostat Housing 05035	λ .003 t 98.8		
Cooling Water Pump 0504	t 98.8	Gasket 05041	λ .054 t 98.8	Bearing 05042	λ .019 t 98.8	Shaft 05043	λ .064 t 98.8	Hub 05044	λ .001 t 98.8	Cooling Water Pump 0504	λ .184 t 98.8		
Fan Assembly 0505	t 98.8	Blade 05051	λ .058 t 98.8	Belt 05052	λ .746 t 98.8	Pulley 05053	λ .067 t 98.8	Bearing 05054	λ .025 t 98.8	Fittings 05055	λ .018 t 98.8	Fan Assembly 0505	λ .036 t 98.8

Figure 7. COOLING SYSTEM RELIABILITY BLOCK DIAGRAM



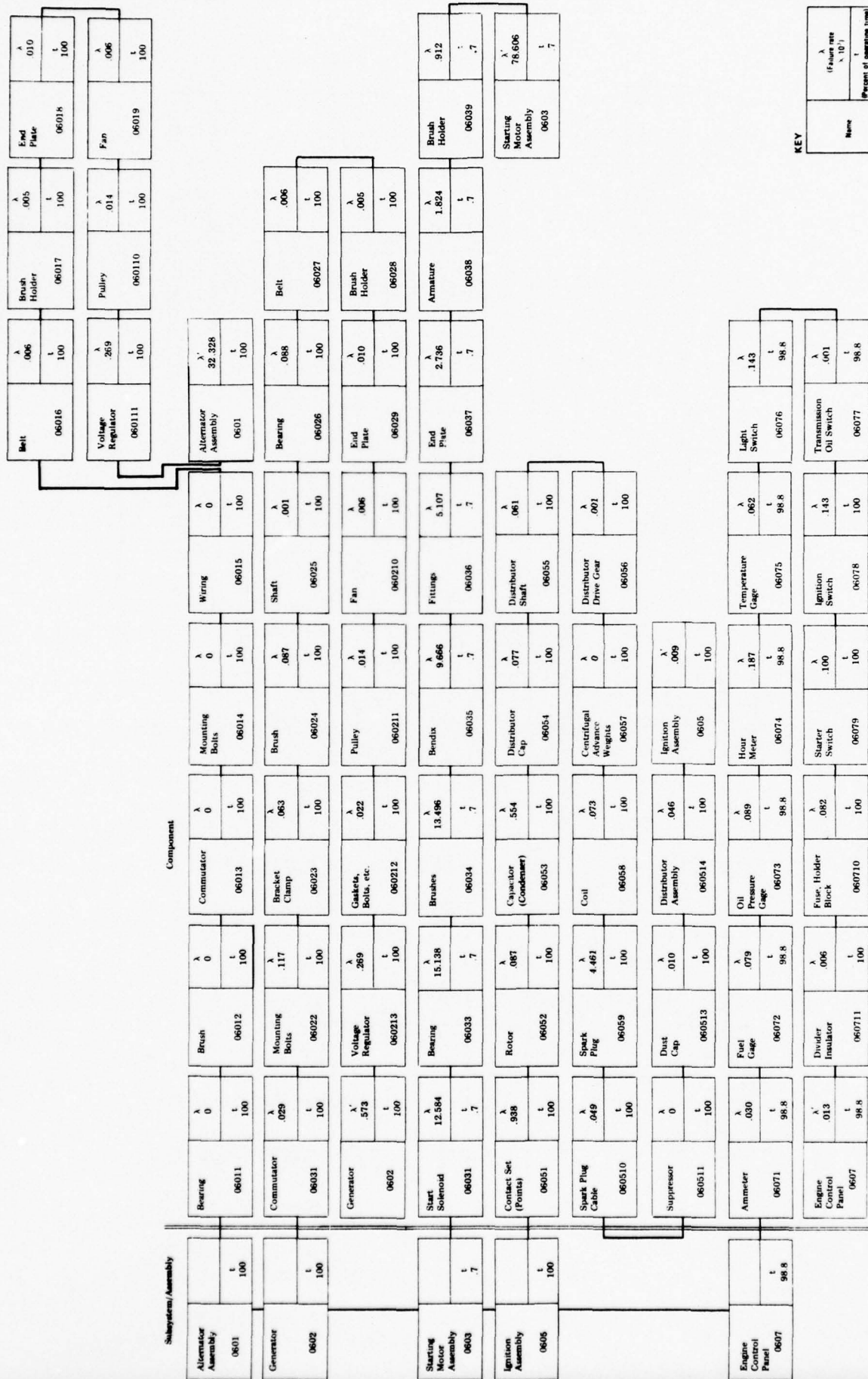


Figure 8 ELECTRICAL SYSTEM RELIABILITY BLOCK DIAGRAM  
(Sheet 1 of 2)

Subsystem/Assembly		Component									
Lights	t	25	2.232	t	25	2.099	t	25	.097	t	25
Headlight	t	25	.019	t	25	.072	t	25	.043	t	25
Tailight	t	25	.019	t	25	.072	t	25	.043	t	25
Wiring	t	25	.019	t	25	.072	t	25	.043	t	25
Mountings	t	25	.019	t	25	.072	t	25	.043	t	25
Seal Beam	t	25	.019	t	25	.072	t	25	.043	t	25
Bulbs	t	25	.019	t	25	.072	t	25	.043	t	25
Lights	t	25	.019	t	25	.072	t	25	.043	t	25
Fuel Tank S.U.	t	25	.019	t	25	.072	t	25	.043	t	25
Transmission Oil Temp. S.U.	t	25	.019	t	25	.072	t	25	.043	t	25
Fuel Tank S.U.	t	25	.019	t	25	.072	t	25	.043	t	25
Relay	t	25	.019	t	25	.072	t	25	.043	t	25
Horn Assembly	t	25	.019	t	25	.072	t	25	.043	t	25
Storage Battery	t	25	.019	t	25	.072	t	25	.043	t	25
Chassis Wiring Harness	t	25	.019	t	25	.072	t	25	.043	t	25

KEY

None	λ
None	(Substrate λ 10°)
None	(Percent of starting time)

Figure 8. (Sheet 2 of 2)



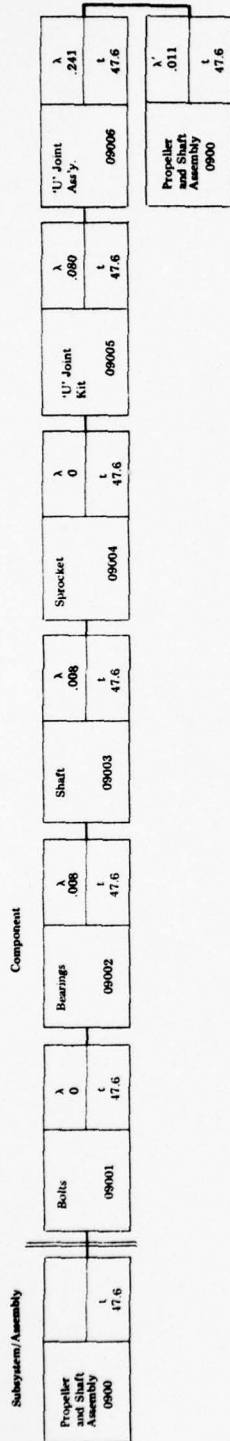


Figure 10. PROPELLER AND SHAFT SYSTEM RELIABILITY BLOCK DIAGRAM

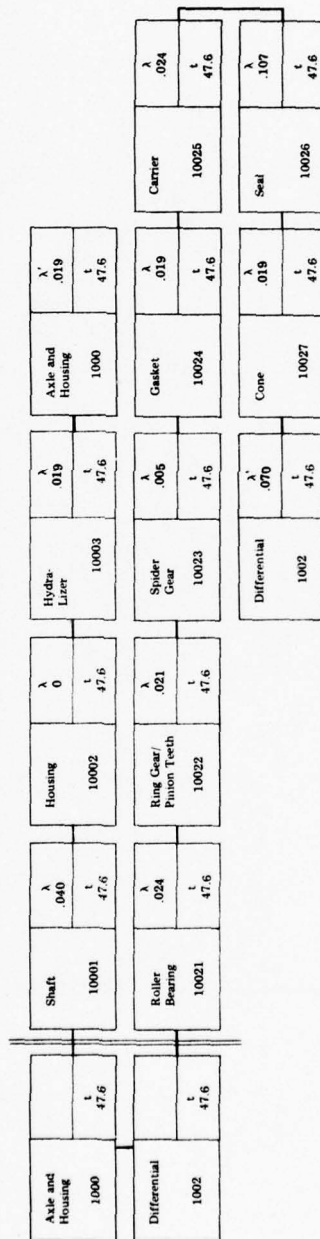


Figure 11. FRONT AXLE SYSTEM RELIABILITY BLOCK DIAGRAM

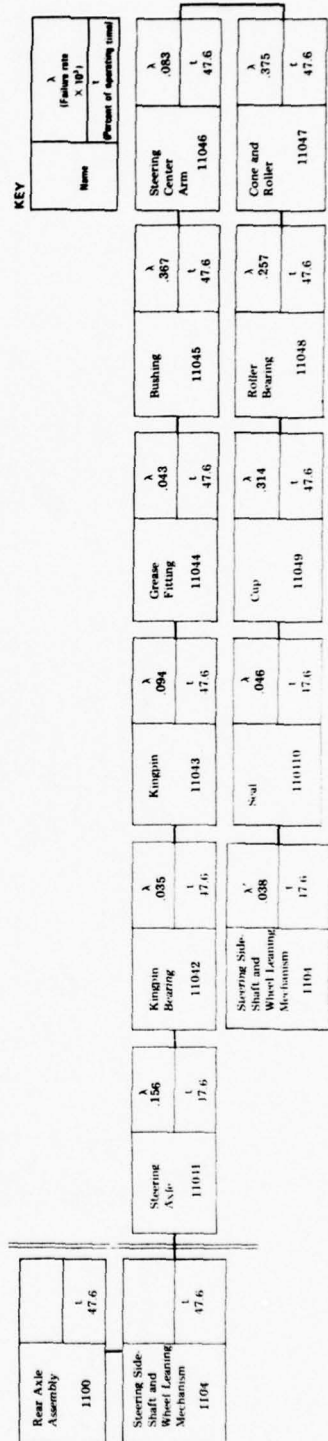


Figure 12. REAR AXLE SYSTEM RELIABILITY BLOCK DIAGRAM





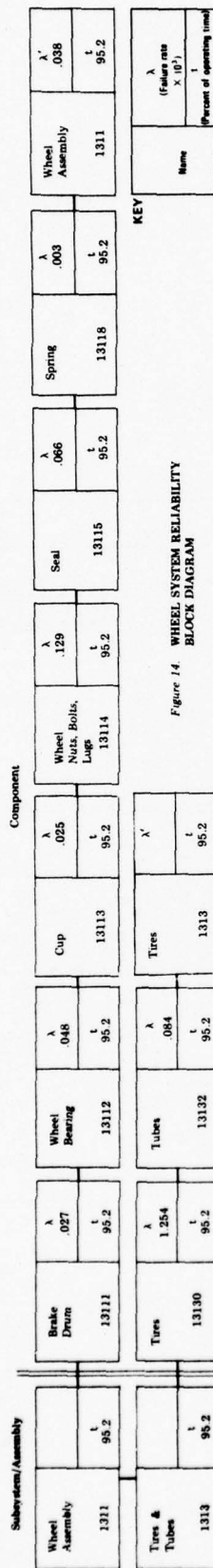


Figure 14 WHEEL SYSTEM RELIABILITY BLOCK DIAGRAM

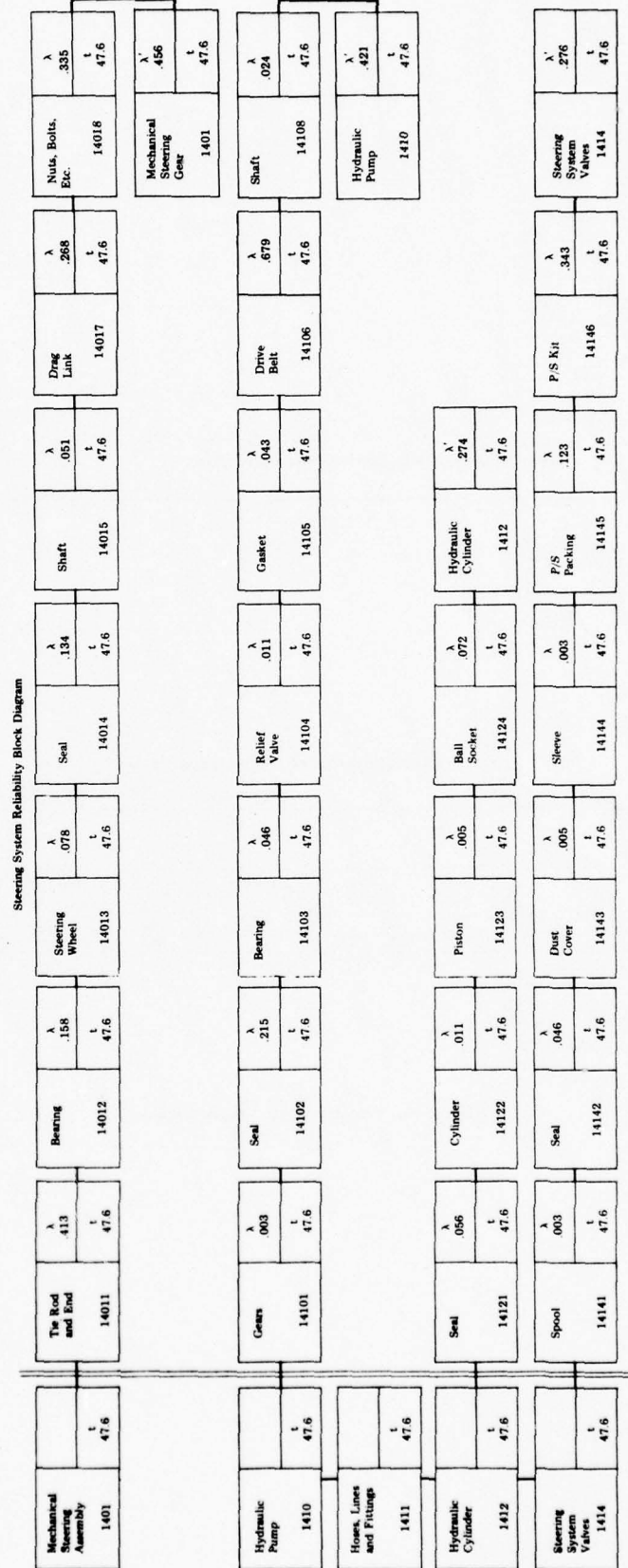


Figure 15 STEERING SYSTEM RELIABILITY BLOCK DIAGRAM

Subsystem/Assembly	
Frame Assembly  1501	
	t 95.2
Counterweight  1502	
	t 95.2

Figure 16. FRAME SYSTEM RELIABILITY BLOCK DIAGRAM

Leaf Springs		
	1601	t 95.2
Clamps, nuts, bolts		
	1602	t 95.2

KEY

Name	$\lambda$ (Failure rate $\times 10^{-5}$ )
	t (Percent of operating time)

Figure 17. SUSPENSION SYSTEM RELIABILITY BLOCK DIAGRAM

Body Assembly		Hinge	$\lambda$ .004	Latch	$\lambda$ .013	Structure	$\lambda$ .294	Floor Board Ass'y.	$\lambda$ .030
	1801		t 95.2		t 95.2		t 95.2		t 95.2
Seats								Body Assembly	$\lambda'$ .012
	1806		t 100						t 95.2

Figure 18. BODY SYSTEM RELIABILITY BLOCK DIAGRAM





## APPENDIX A

### COMPONENT MISSION PROFILE MATRIX

This appendix presents the matrix from which the mission profile for the gasoline-engine-driven fork-lift truck was developed. It indicates the function or functions for which each component, identified by its Function Group Code, is required to operate. In compiling the matrix, we made assumptions concerning mission time for some components, as follows:

1. The lights and associated accessories are required to operate 25 percent of the total mission time.
2. The horn and its associated accessories are required to operate 2.1 percent of the total mission time.
3. The components associated with the creeping/inching function are used 22 percent of the time during the lift and deposit functions.

These assumptions are based upon the observations made of the operation of the trucks.

Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
0100	X	X	X	X	X	X	
01001	X	X	X	X	X	X	
01002	X	X	X	X	X	X	
01003	X	X	X	X	X	X	
01004	X	X	X	X	X	X	
01005	X	X	X	X	X	X	
01006	X	X	X	X	X	X	
01007	X	X	X	X	X	X	
01008	X	X	X	X	X	X	
01009	X	X	X	X	X	X	
0101	X	X	X	X	X	X	
01011	X	X	X	X	X	X	
01012	X	X	X	X	X	X	
01013	X	X	X	X	X	X	
01014	X	X	X	X	X	X	
0102	X	X	X	X	X	X	
01021	X	X	X	X	X	X	
01022	X	X	X	X	X	X	
01023	X	X	X	X	X	X	
01024	X	X	X	X	X	X	
01025	X	X	X	X	X	X	
01026	X	X	X	X	X	X	

# Component Mission Profile

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
0103	X	X	X	X	X	X	
01031	X	X	X	X	X	X	
01032	X	X	X	X	X	X	
01033	X	X	X	X	X	X	
0104	X	X	X	X	X	X	
01041	X	X	X	X	X	X	
01042	X	X	X	X	X	X	
01043	X	X	X	X	X	X	
01044	X	X	X	X	X	X	
0105	X	X	X	X	X	X	
01051	X	X	X	X	X	X	
01052	X	X	X	X	X	X	
01053	X	X	X	X	X	X	
01054	X	X	X	X	X	X	
01055	X	X	X	X	X	X	
01056	X	X	X	X	X	X	
01057	X	X	X	X	X	X	
01058	X	X	X	X	X	X	
01059	X	X	X	X	X	X	
010510	X	X	X	X	X	X	
010511	X	X	X	X	X	X	
010512	X	X	X	X	X	X	
010513	X	X	X	X	X	X	

# Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
010515	X	X	X	X	X	X	
0106	X	X	X	X	X	X	
01061	X	X	X	X	X	X	
01062	X	X	X	X	X	X	
01063	X	X	X	X	X	X	
01064	X	X	X	X	X	X	
01065	X	X	X	X	X	X	
01066	X	X	X	X	X	X	
01067	X	X	X	X	X	X	
01068	X	X	X	X	X	X	
01069	X	X	X	X	X	X	
0108	X	X	X	X	X	X	
01081	X	X	X	X	X	X	
01082	X	X	X	X	X	X	
01083	X	X	X	X	X	X	
0109	X	X	X	X	X	X	
0301	X	X	X	X	X	X	
03011	X	X	X	X	X	X	
03012	X	X	X	X	X	X	



# Component Mission Profile Matrix

Component/ Assembly	Function					
	Start	Idle	Drive	Lift	Transport	Deposit
03013	X	X	X	X	X	X
03015	X	X	X	X	X	X
03016	X	X	X	X	X	X
0302	X	X	X	X	X	X
03021	X	X	X	X	X	X
03022	X	X	X	X	X	X
03023	X	X	X	X	X	X
03024	X	X	X	X	X	X
03025	X	X	X	X	X	X
0304	X	X	X	X	X	X
03041	X	X	X	X	X	X
03042	X	X	X	X	X	X
04043	X	X	X	X	X	X
03044	X	X	X	X	X	X
0306	X	X	X	X	X	X
03061	X	X	X	X	X	X
03062	X	X	X	X	X	X
0308	X	X	X	X	X	X
03081	X	X	X	X	X	X
03082	X	X	X	X	X	X
03083	X	X	X	X	X	X
03084	X	X	X	X	X	X

# Component Mission Profile Matrix

Component/ Assembly	Function					
	Start	Idle	Drive	Lift	Transport	Deposit
03085	X	X	X	X	X	X
03086	X	X	X	X	X	X
03087	X	X	X	X	X	X
03088	X	X	X	X	X	X
0309	X	X	X	X	X	X
0312	X	X	X	X	X	X
03121	X	X	X	X	X	X
03122	X	X	X	X	X	X
03123	X	X	X	X	X	X
03124	X	X	X	X	X	X
03125	X	X	X	X	X	X
0401		X	X	X	X	X
04011		X	X	X	X	X
04012		X	X	X	X	X
04013		X	X	X	X	X
04014		X	X	X	X	X
04015		X	X	X	X	X
04016		X	X	X	X	X

Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
0501		X	X	X	X	X	
05011		X	X	X	X	X	
05012		X	X	X	X	X	
05013		X	X	X	X	X	
05014		X	X	X	X	X	
0503		X	X	X	X	X	
05031		X	X	X	X	X	
05032		X	X	X	X	X	
05033		X	X	X	X	X	
05034		X	X	X	X	X	
05035		X	X	X	X	X	
0504		X	X	X	X	X	
05041		X	X	X	X	X	
05042		X	X	X	X	X	
05043		X	X	X	X	X	
05044		X	X	X	X	X	
0505		X	X	X	X	X	
05051		X	X	X	X	X	
05052		X	X	X	X	X	
05053		X	X	X	X	X	
05054		X	X	X	X	X	
05055		X	X	X	X	X	

# Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
0601	X	X	X	X	X	X	X
06011	X	X	X	X	X	X	X
06012	X	X	X	X	X	X	X
06013	X	X	X	X	X	X	X
06014	X	X	X	X	X	X	X
06015	X	X	X	X	X	X	X
06016-06011	X	X	X	X	X	X	X
0602	X	X	X	X	X	X	X
06021	X	X	X	X	X	X	X
06022	X	X	X	X	X	X	X
06023	X	X	X	X	X	X	X
06024	X	X	X	X	X	X	X
06025	X	X	X	X	X	X	X
06026	X	X	X	X	X	X	X
06027	X	X	X	X	X	X	X
06028	X	X	X	X	X	X	X
06029	X	X	X	X	X	X	X
060210	X	X	X	X	X	X	X
060211	X	X	X	X	X	X	X
060212	X	X	X	X	X	X	X
060213	X	X	X	X	X	X	X
0603	X						
06031	X						
06033	X						



Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
06034	X						
06035	X						
06036	X						
06037	X						
06038	X						
06039	X						
0605	X	X	X	X	X	X	X
06051	X	X	X	X	X	X	X
06052	X	X	X	X	X	X	X
06053	X	X	X	X	X	X	X
06054	X	X	X	X	X	X	X
06055	X	X	X	X	X	X	X
06056	X	X	X	X	X	X	X
06057	X	X	X	X	X	X	X
06058	X	X	X	X	X	X	X
06059	X	X	X	X	X	X	X
060510	X	X	X	X	X	X	X
060511	X	X	X	X	X	X	X
060513	X	X	X	X	X	X	X
060514	X	X	X	X	X	X	X

# Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
0607		X	X	X	X	X	
06071		X	X	X	X	X	
06072		X	X	X	X	X	
06073		X	X	X	X	X	
06074		X	X	X	X	X	
06075		X	X	X	X	X	
06076		X	X	X	X	X	
06077		X	X	X	X	X	
06078	X	X	X	X	X	X	X
06079	X	X	X	X	X	X	X
060710	X	X	X	X	X	X	X
060711	X	X	X	X	X	X	X
0609							
06091							
06092							
06093							
06094							
06095							
06096							
0610		X	X	X	X	X	
06101		X	X	X	X	X	
06102		X	X	X	X	X	
06103		X	X	X	X	X	

Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
06104		X	X	X	X	X	
06105		X	X	X	X	X	
06106		X	X	X	X	X	
06107		X	X	X	X	X	
0611							
06111							
06112							
06113							
06114							
06115							
06117							
2.1% of Total Mission Time							
0612	X	X	X	X	X	X	X
06121	X	X	X	X	X	X	X
06122	X	X	X	X	X	X	X
06123	X	X	X	X	X	X	X
06124	X	X	X	X	X	X	X
06125	X	X	X	X	X	X	X
0613	X	X	X	X	X	X	X
06131	X	X	X	X	X	X	X
06132	X	X	X	X	X	X	X

Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
0708			X		X		
07081			X		X		
07082			X		X		
07083			X		X		
07084			X		X		
07085			X		X		
07086			X		X		
07087			X		X		
07088			X		X		
07089			X		X		
0710			X		X		
07101			X		X		
07102			X		X		
07103			X		X		
07104			X		X		
07105			X		X		
07106			X		X		
07107			X		X		
07108			X		X		
07109			X		X		
071010			X		X		
0713			X		X		
07131			X		X		
07132			X		X		



Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
07133			X		X		
07134			X		X		
07135			X		X		
0714			X		X		
07141			X		X		
07142			X		X		
07143			X		X		
07144			X		X		
07145			X		X		
07146			X		X		
07147			X		X		
07148			X		X		
07149			X		X		
0721			X		X		
07211			X		X		
07212			X		X		
07213			X		X		
07214			X		X		
07215			X		X		
07216			X		X		

Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
0900			X		X		
09001			X		X		
09002			X		X		
09003			X		X		
09004			X		X		
09005			X		X		
09006			X		X		
1000			X		X		
10001			X		X		
10002			X		X		
10003			X		X		
1002			X		X		
10021			X		X		
10022			X		X		
10023			X		X		
10024			X		X		
10025			X		X		
10026			X		X		
10027			X		X		
1100			X		X		

Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
1104			X		X		
11041			X		X		
11042			X		X		
11043			X		X		
11044			X		X		
11045			X		X		
11046			X		X		
11047			X		X		
11048			X		X		
11049			X		X		
110410			X		X		
1204		X	X	X	X	X	
12041		X	X	X	X	X	
12042		X	X	X	X	X	
12043		X	X	X	X	X	
12044		X	X	X	X	X	
12045		X	X	X	X	X	
12046		X	X	X	X	X	
12047		X	X	X	X	X	
12048		X	X	X	X	X	
12049		X	X	X	X	X	
120410		X	X	X	X	X	
120411		X	X	X	X	X	
120412		X	X	X	X	X	

# Component Mission Profile Matrix

Component/ Assembly	Function					
	Start	Idle	Drive	Lift	Transport	Deposit
120413 120414				X X		X X
1206 12061 12062 12063 12064		X X X X X	X X X X X	X X X X X	X X X X X	X X X X X
1201 12011 12012 12013 12014 12015		X X X X X X	X X X X X X	X X X X X X	X X X X X X	X X X X X X
1202 12021 12022 12023 12024 12025 12026 12027 12028		X X X X X X X X X	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X	X X X X X X X X X



Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
12029				X x22%		X x22%	
12030		X	X	X	X	X	
1311			X	X	X	X	
13112			X	X	X	X	
13113			X	X	X	X	
13114			X	X	X	X	
13115			X	X	X	X	
13118			X	X	X	X	
13131			X	X	X	X	
13132			X	X	X	X	
1401			X		X		
14011			X		X		
14012			X		X		
14013			X		X		
14014			X		X		
14015			X		X		
14017			X		X		
14018			X		X		

# Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
1410			X		X		
14101			X		X		
14102			X		X		
14103			X		X		
14104			X		X		
14105			X		X		
14106			X		X		
14107			X		X		
14108			X		X		
1411			X		X		
1412			X		X		
14121			X		X		
14122			X		X		
14123			X		X		
14124			X		X		
1414			X		X		
14141			X		X		
14142			X		X		
14143			X		X		
14144			X		X		
14145			X		X		
14146			X		X		

Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
1501			X	X	X	X	
1502			X	X	X	X	
1601			X	X	X	X	
1602			X	X	X	X	
1801			X	X	X	X	
18011			X	X	X	X	
18012			X	X	X	X	
18013			X	X	X	X	
18015			X	X	X	X	
18062	X	X	X	X	X	X	X
2401				X		X	
24011				X		X	
24012				X		X	
24013				X		X	
24014				X		X	
24015				X		X	
24016				X		X	
24017				X		X	

# Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
2402				X		X	
24021				X		X	
24022				X		X	
24023				X		X	
24024				X		X	
24025				X		X	
24026				X		X	
24027				X		X	
24028				X		X	
24029				X		X	
2403				X		X	
24031				X		X	
24032				X		X	
24033				X		X	
2404				X		X	
24041				X		X	
24042				X		X	
24043				X		X	
24044				X		X	
24045				X		X	
24046				X		X	
24047				X		X	
24048				X		X	



Component Mission Profile Matrix

Component/ Assembly	Function						
	Start	Idle	Drive	Lift	Transport	Deposit	Stop
2405			X	X	X	X	
24051			X	X	X	X	
24053			X	X	X	X	
24054			X	X	X	X	
24055			X	X	X	X	
24056			X	X	X	X	
24057			X	X	X	X	
24058			X	X	X	X	
24059			X	X	X	X	
240510			X	X	X	X	
240511			X	X	X	X	
240512			X	X	X	X	
240513			X	X	X	X	
240514			X	X	X	X	
2501			X		X		
25011			X		X		
25012			X		X		
25013			X		X		
25014			X		X		
25015			X		X		
25016			X		X		

Component Mission Profile Matrix

Component/ Assembly	Function					
	Start	Idle	Drive	Lift	Transport	Deposit
2406			X	X	X	X
24061			X	X	X	X
24062			X	X	X	X
24063			X	X	X	X
24064			X	X	X	X
24065			X	X	X	X

## APPENDIX B

### COMPONENT RELIABILITY AND MAINTAINABILITY DATA

#### NOTE

The values marked by an asterisk are for the "phantom" component that represents failures ascribed to the subsystem/assembly as a whole. This rate must be added to the other appropriate component failure rates to determine the failure rate of the subsystem/assembly.

The failure rates shown for the components represent the rate of failure for that component group in the subsystem/assembly of which it is a part. For example, the failure rate for spark plugs is the spark-plug group rate rather than a single spark-plug rate.

## FORK LIFT TRUCK - RELIABILITY AND MAINTAINABILITY DATA

Component Name	Accumulated Hours	Number of Failures	Failures/ 10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
0100 Engine Assembly	779374	109	.140*	1132.9	13.99	81	4.98	.99930
01001 Attaching Parts	779374	14	.018	7.0	.88	8		.99991
01002 Mountings	779374	117	.150	106.10	1.23	86		.99325
01003 Gasket Sets	779374	48	.062	50.00	2.94	17		.99969
01004 Rear Seal	779374	17	.022	34.20	2.44	14		.99989
01005 Accessory Drive	779374	25	.032	28.00	1.87	15		.99984
01006 Timing Gear Assembly	779374	11	.014	79.00	9.87	8		.99993
01007 Ring Assembly	779374	52	.067	29.50	2.46	12		.99967
01008 Rods/Bearing Ass'y	779374	40	.051	19.50	1.77	11		.99975
01009 Cylinder Sleeve	779374	21	.027	---	---	0		.99987
0101 Crankcase	---	---	---	---	---	---	4.98	1.0000
01011 Block	779374	29	.037	60.70	4.05	15		.99982
01012 Cylinder Head	779374	24	.031	38.70	2.58	15		.99985
01013 Head Gasket	779374	21	.027	12.00	2.00	6		.99987
01014 Expander Plug	779374	12	.015	6.40	0.53	12		.99992
0102 Crankshaft Ass'y	779374	19	.024*	7.50	1.50	5	4.98	.99988
01021 Crankshaft Bearing	779374	113	.145	70.00	2.92	24		.99928
01022 Crankshaft Gear	779374	65	.083	57.90	1.48	39		.99959
01023 Crankshaft Journal	779374	2	.003	4.00	2.00	2		.99998
01024 Seal	779374	51	.065	66.50	2.02	33		.99968
01025 Gear Coupling	779374	4	.005	2.20	1.10	2		.99997
01026 Pulley	779374	9	.011	10.50	1.50	7		.99994
0103 Flywheel Assembly	779374	11	.014*	12.90	1.43	9	4.98	.99993
01031 Ring Gear	779374	19	.024	65.00	3.82	17		.99988
01032 Pilot Bushing	779374	4	.005	2.00	0.50	4		.99997
01033 End Bell	779374	4	.005	4.50	1.12	4		.99997

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Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/ 10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
0104	Pistons	779374	120	.154*	56.50	1.49	38	4.98	.99923
01041	Piston Rings	779374	66	.085	17.50	1.35	13		.99958
01042	Wrist Pin	779374	70	.090	15.50	0.60	26		.99955
01043	Expander Ring	779374	2	.003	-----	-----	0		.99998
01044	Connecting Rod	779374	40	.051	7.00	0.35	20		.99975
0105	Valves	779374	200	.257*	61.00	1.33	46	4.98	.99872
01051	Push Rods	779374	11	.014	0.50	0.50	1		.99993
01052	Rocker Arm	779374	4	.005	1.50	0.38	4		.99997
01053	Valve Spring	779374	32	.041	5.50	0.50	11		.99980
01054	Valve Guide	779374	187	.240	40.00	1.03	39		.99880
01055	Valve Cover	779374	54	.069	30.30	0.62	49		.99966
01056	Gasket	779374	155	.199	106.80	1.00	107		.99901
01057	Camshaft	779374	8	.010	3.00	3.00	1		.99995
01058	Camshaft Gear	779374	68	.087	67.90	1.66	41		.99957
01059	Camshaft Key	779374	2	.003	1.00	0.50	2		.99998
010510	Lifter	779374	2	.003	-----	-----	0		.99998
010511	Camshaft Bearing	779374	69	.089	12.00	0.63	19		.99956
010512	Spur Gear	779374	71	.091	81.70	1.60	51		.99955
010513	Nuts, Bolts, Misc.	779374	42	.053	23.00	1.28	18		.99974
010515	P.C. Valve	779374	.4	.005	2.50	1.25	2		.99997
0106	Engine Lubrication	779374	6	.008*	3.20	0.80	4	4.98	.99996
01061	Gaskets	779374	47	.060	52.20	1.21	43		.99970
01062	Oil Filter	779374	230	.295	148.80	0.71	209		.99853
01063	Crankcase Breather	779374	83	.106	36.10	0.54	67		.99947
01064	Oil Pump	779374	22	.028	14.70	1.63	9		.99986
01065	Oil Lines, Fittings etc.	779374	162	.208	99.80	0.71	141		.99896
01067	Oil Tank	779374	2	.003	-----	-----	0		.99998
01068	Oil Pan	779374	12	.015	7.00	0.58	12		.99992
01069	Dip Stick	779374	5	.006	2.00	0.67	3		.99997

Component Code	Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Failure
0108	Engine Manifold	779374	3	.004*	2.20	0.73	3	4.98	.99999
01081	Gasket	779374	8	.010	8.00	1.33	6		.99999
01082	Heat Control Shaft	779374	6	.008	3.30	0.55	6		.99999
01083	Heat Control Thermostat	779374	1	.001	1.00	1.00	1		.99999
0109	Engine Accessories	779374	1	.001*	0.50	0.50	1	4.98	.99999
0301	Carburetor Assembly	779374	224	.288*	170.90	0.90	189	4.98	.99857
03011	Gasket	779374	3	.004	1.00	1.00	1		.99998
03012	Filter Element	779374	9	.012	3.80	0.47	8		.99994
03013	Needle Valve	779374	0	0.0	0.0	0.0	0		1.00000
03014	Float	779374	1	.001	0.50	0.50	1		.99999
03105	Choke	779374	13	0.017	15.00	1.67	9		.99991
0302	Fuel Pump	779374	103	.132*	112.60	1.37	82	4.98	.99934
03021	Gasket	779374	15	.019	8.90	0.68	13		.99990
03022	Diaphragm	779374	1	.001	0.50	0.50	1		.99999
03023	Relief Valve	779374	0	0.0	0.0	0.0	0		1.00000
03024	Discharge Valve	779374	0	0.0	0.0	0.0	0		1.00000
03025	Bolts, Fittings, etc	779374	22	.028	12.20	0.55	22		.99986
0304	Air Cleaner	779374	18	.023*	50.30	3.59	14	4.98	.99999
03041	Cleaner Element	779374	3	.004	1.00	0.50	2		.99999
03042	Mounting	779374	3	.004	2.90	0.97	3		.99999
03043	Hose	779374	72	.092	30.10	0.53	57		.99954
03044	Scoop	779374	17	.022	3.70	0.46	8		.99969

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Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
0306 03061 03062	Fuel Tank Lines Cap, Strainer	779374 779374 779374	20 7 18	.026* .009 .023	62.00 5.50 3.50	3.44 0.79 0.29	18 7 12	4.98	.99987 .99995 .99989
0308 03081 03082 03083 03084 03085 03086 03087 03088	Governor Plug Gasket Seal Bearing Linkage Weights Bushing Spring	779374 779374 779374 779374 779374 779374 779374 779374 779374	26 0 0 3 34 1 0 6	.033* 0.0 0.0 .004 0.0 .004 .001 0.0 .008	39.20 0.0 0.0 0.20 27.40 1.00 0.0 1.00	1.96 0.00 0.00 0.20 0.81 1.00 0.0 0.25	20 0 0 1 34 1 0 4	4.98	.99984 1.0000 1.0000 .99998 1.0000 .99978 .99999 1.0000 .99996
0309	Fuel Filter	779374	0	0.0*	0.0	0.0	0	4.98	1.0000
0312 03121 03122 03123 03124 03125	Accelerator Throttle & Choke Linkage Spring Connecting Pin Pedal Roller	779374 779374 779374 779374 779374 779374	32 106 8 3 33 4	.041* .136 .010 .004 .042 .005	19.40 64.90 2.80 2.00 13.20 1.50	0.88 0.84 0.70 0.67 0.57 0.75	22 77 4 3 23 2	4.98	.99980 .99932 .99995 .99998 .99979 .99997
0401 04011 04012 04013 04014 04015 04016	Muffler and Pipe Assembly Gasket Muffler Pipe Elbow Clamp Fittings	773891 773891 773891 773891 773891 773891 773891	19 24 41 127 10 76 15	.025* .031 .053 .164 .013 .098 .019	16.00 15.80 62.80 99.40 8.20 21.80 7.20	0.94 0.88 1.85 0.92 0.91 0.56 0.65	17 18 34 108 9 39 11	4.94	.99988 .99985 .99974 .99919 .99994 .99952 .99991

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Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/ 10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
0501	Radiator Assembly	773891	310	.401*	664.70	2.43	274	4.94	.99802
05011	Radiator Cap	773891	28	.036	10.80	0.54	20		.99982
05012	Core	773891	55	.071	35.40	0.64	55		.99965
05013	Overflow Pipe	773891	17	.022	16.00	0.94	17		.99989
05014	Fittings	773891	98	.127	48.90	0.65	75		.99937
0503	Water Manifold	773891	1	.001*	1.00	1.00	1	4.94	.99999
05031	Fittings	773891	17	.022	4.80	0.37	13		.99989
05032	Hose	773891	251	.324	161.50	0.86	187		.99840
05033	Thermostat	773891	26	.034	18.00	1.06	17		.99983
05034	Gasket	773891	11	.014	6.90	0.86	8		.99993
05035	Thermostat Housing	773891	2	.003	1.00	0.50	2		.99998
0504	Water Pump	773891	142	.184*	234.20	2.17	108	4.94	.99909
05041	Gasket	773891	42	.054	28.10	0.80	35		.99973
05042	Bearing	773891	15	.019	21.00	1.50	14		.99991
05043	Shaft	773891	65	.084	89.60	1.91	47		.99958
05044	Hub	773891	1	.001	1.50	1.50	1		.99999
0505	Fan Assembly	773891	28	.036*	45.10	1.73	26	4.94	.99982
05051	Blade	773891	45	.058	40.70	1.27	32		.99971
05052	Belt	773891	577	.746	278.50	0.63	440		.99631
05053	Pulley	773891	52	.067	67.30	1.50	45		.99967
05054	Bearing	773891	19	.025	24.50	1.88	13		.99988
05055	Fittings	773891	14	.018	4.30	0.36	12		.99991

\*See important note on Appendix cover sheet



## FORK LIFT TRUCK - RELIABILITY AND MAINTAINABILITY DATA

Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/ 10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
0601	Alternator Assembly	3051	1	0.328*	2.00	2.00	1	5.00	.99999
06011	Bearing	3051	0	0.0	0.0	0.0	0		1.0000
06012	Brush	3051	0	0.0	0.0	0.0	0		1.0000
06013	Commutator	3051	0	0.0	0.0	0.0	0		1.0000
06014	Mounting Bolts	3051	0	0.0	0.0	0.0	0		1.0000
06015	Wiring	3051	0	0.0	0.0	0.0	0		1.0000
* *									
0602	Generator	780239	447	.573*	630.30	1.68	376	5.00	.99713
06021	Commutator	780239	23	.029	11.00	1.22	9		.99985
06022	Mounting Bolts	780239	91	.117	66.90	0.77	87		.99941
06023	Bracket, Clamp	780239	49	.063	55.20	1.20	46		.99968
06024	Brush	780239	68	.087	30.90	0.94	33		.99956
06025	Shaft	780239	1	.001	0.50	0.50	1		.99999
06026	Bearing	780239	69	.088	26.50	1.20	22		.99956
* * 06027	Belt	780239	5	.006	2.50	0.50	5		.99997
* * 06028	Brush Holder	780239	4	.005	1.00	0.33	3		.99997
* * 06029	End Plate	780239	8	.010	3.30	0.82	4		.99995
* * 060210	Fan	780239	5	.006	2.30	1.15	2		.99997
* * 060211	Pulley	780239	11	.014	6.90	0.86	8		.99993
060212	Gaskets, Bolts, Etc.	780239	17	.022	2.90	0.41	7		.99989
* * 060213	Voltage Regulator	780239	211	.269	117.30	0.97	182		.99865
0603	Starter Assembly	5483.04	431	78.606*	675.10	1.77	362	.035	.99725
06031	Start Solenoid	5483.04	69	12.584	47.40	1.03	46		.99956
06033	Bearings	5483.04	83	15.138	46.00	1.44	32		.99947
06034	Brushes	5483.04	74	13.496	35.70	1.19	30		.99953
06035	Bendix	5483.04	53	9.666	26.00	1.37	19		.99966
06036	Fittings	5483.04	28	5.107	19.50	0.89	22		.99982
06037	End Plate	5483.04	15	2.736	5.10	1.70	3		.99990
06038	Armature	5483.04	10	1.824	4.50	0.90	5		.99994
06039	Brush Holder	5483.04	5	.912	0.50	0.50	1		.99997

## FORK LIFT TRUCK - RELIABILITY AND MAINTAINABILITY DATA

Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliability
0605	Ignition Assembly	783290	7	.009*	7.50	1.50	5	5.00	.99995
06051	Contact Set	783290	735	.938	295.50	0.57	523		.99931
06052	Rotor	783290	68	.087	18.40	0.42	44		.99956
06053	Capacitor (condenser)	783290	434	.554	145.40	0.49	296		.99923
06054	Distributor Cap	783290	60	.077	23.90	0.66	36		.99961
06055	Distributor Shaft	783290	48	.061	25.20	0.52	48		.99969
06056	Distributor Drive Gear	783290	1	.001	0.50	0.50	1		.99999
06057	Centrifugal Adv. Weights	783290	0	0.0	0.0	0.0	0		1.0000
06058	Coil	783290	57	.073	25.20	0.66	38		.99963
06059	Spark Plug	783290	931	1.189	392.30	0.16	2397		.99981
060510	Spark Plug Cable	783290	38	.049	10.70	0.75	14		.99975
060511	Suppressor	783290	0	0.0	0.0	0.0	0		1.0000
060513	Dust Cap	783290	8	.010	2.70	0.34	8		.99995
060514	Distributor Assembly	783290	36	.046	29.80	1.03	29		.99977
0607	Engine Control Panel	773891	10	.013*	5.70	0.57	10	4.94	.99940
06071	Ammeter	773891	23	.030	16.00	0.94	17		.99985
06072	Fuel Gage	773891	61	.079	32.50	0.76	43		.99961
06073	Oil Pressure Gage	773891	69	.089	33.70	0.65	52		.99956
06074	Hour-Meter	773891	145	.187	80.70	0.86	94		.99908
06075	Temperature Gage	773891	48	.062	29.30	0.81	36		.99969
06076	Light Switch	773891	111	.143	48.80	0.65	75		.99929
06077	Transmission Oil Switch	773891	1	.001	0.50	0.50	1	5.00	.99999
06078	Ignition Switch	783290	112	.143	81.50	0.88	93		.99928
06079	Starter Switch	783290	78	.100	53.10	0.86	62		.99950
060710	Fuse, Holder, Block	783290	64	.082	18.40	0.32	57		.99969
060711	Divider (Insulator)	783290	5	.006	2.00	1.00	2		.99997

\*See important note on Appendix cover sheet

Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
0609	Lights	195822	57	.291*	33.50	0.73	46	1.25	.99964
06091	Headlight	195822	437	2.232	236.70	0.64	369		.99721
06092	Tail Light	195822	411	2.099	241.10	0.66	365		.99738
06093	Wiring	195822	19	.097	6.40	0.38	17		.99988
06094	Mountings	195822	14	.071	5.70	0.47	12		.99991
06095	Seal Beam	195822	196	1.001	62.00	0.60	104		.99875
06096	Bulbs	195822	448	2.287	71.00	0.51	140		.99714
0610	Sending Units								
06101	Hour-Meter	773891	15	.019*	7.30	0.73	10	4.94	.99991
06102	Oil Pressure SU	773891	56	.072	25.50	0.62	41		.99964
06103	Water Temperature SU								
06104	Fuel Gage SU	773891	33	.043	15.00	0.75	20		.99979
06105	Transmission Oil Warning Light	773891	35	.045	17.20	0.78	22		.99978
06106	Fuel Tank SU	773891	4	.005	1.50	0.75	2		.99997
06107	Transmission Oil Temperature SU	773891	4	.005	1.50	0.50	3		.99997
			1	.001	0.50	0.50	1		.99999
0611	Horn Assembly	16449	151	9.180*	85.80	0.64	135	.105	.99904
06111	Button Spring	16449	5	.304	1.30	0.43	3		.99997
06112	Horn	16449	69	4.195	32.50	0.57	57		.99956
06113	Cable	16449	6	.365	6.00	1.00	6		.99996
06114	Button Cover	16449	41	2.493	108.60	2.78	39		.99974
06115	Contact	16449	48	2.918	20.30	0.58	35		.99969
06116	Horn Button Kit	16449	37	2.249	16.60	0.64	26		.99976
06117	Relay	16449	50	3.040	16.20	0.49	33		.99968

\*See important note on Appendix cover sheet



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Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
0612	Storage Battery	783290	242	.309*	152.50	0.93	164	5.00	.99845
06121	Cell	783290	0	0.0	0.0	0.0	0		1.0000
06122	Terminal	783290	51	.065	20.90	0.60	35		.99967
06123	Cable	783290	80	.102	41.30	0.74	56		.99949
06124	Cap	783290	11	.014	2.70	0.25	11		.99993
06125	Frame, Fitting, Etc.	783290	16	.020	5.70	0.47	12		.99990
0613	Chassis Wiring	783290	14	.018*	40.00	6.67	6	5.00	.99991
06131	Harness	783290	14	.018	6.40	0.58	11		.99991
06132	Connectors Wire	783290	101	.128	179.10	2.04	88		.99935
0708	Torque Converter	372846	20	.054*	79.50	5.30	15	2.38	.99987
07081	Gasket	372846	7	.019	0.50	0.50	1		.99995
07082	Bearing	372846	7	.019	4.00	1.33	3		.99995
07083	Clutch	372846	2	.005	---	---	0		.99999
07084	Shaft	372846	4	.011	1.00	1.00	1		.99997
07085	Packing	372846	18	.048	4.00	0.80	5		.99989
07086	Pump	372846	1	.003	---	---	0		.99999
07087	Relief Valve	372846	1	.003	---	---	0		.99999
07088	Housing	372846	4	.011	8.00	8.00	1		.99997
07089	Shoes	372846	3	.008	1.00	0.50	2		.99998
0710	Transmission Assembly	372846	82	.220*	438.50	6.18	71	2.38	.99948
07101	Gears	372846	5	.013	4.50	2.25	2		.99997
07102	Bearing	372846	9	.024	5.00	1.67	3		.99994
07103	Seal	372846	64	.172	63.50	1.63	39		.99959
07104	Screen	372846	0	0.0	0.0	0.0	0		1.0000
07105	Gasket	372846	13	.035	6.10	0.87	7		.99992
07106	Hoses	372846	24	.064	29.50	1.47	20		.99985
07107	Bracket	372846	6	.016	4.50	0.75	6		.99996
07108	Retainer Ring	372846	44	.118	4.00	1.33	3		.99972

0710 CONTINUED ON NEXT PAGE  
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Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/ 10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
07109 071010	Shift Cylinder Neutral Switch	372846 372846	37 35	.099* .094	42.20 22.80	1.24 0.79	34 29	2.38	.99976 .99978
0713 07131 07132 07133 07134 07135	Intermediate Clutch Gears Seal Bearings Piston Clutch Spring	372846 372846 372846 372846 372846 372846	4 2 10 13 4 5	.011* .005 .027 .035 .011 .013	----- 0.30 3.30 3.50 ----- 4.30	----- 0.30 1.10 0.35 ----- 1.07	0 1 3 10 0 4	2.38	.99997 .99999 .99994 .99992 .99997 .99997
0714 07141 07142 07143 07144 07145 07146 07147 07148 07149	Servo Unit Control Knob Linkage Plug Valve Spring Seal Gasket Plunger Valve Tube	372846 372846 372846 372846 372846 372846 372846 372846 372846 372846	11 51 47 2 2 9 10 3 5 1	.030* .137 .126 .005 .005 .024 .027 .008 .013 .003	9.80 23.60 46.30 1.50 2.00 1.40 3.00 1.00 8.50 1.00	2.45 0.58 1.05 0.75 1.00 0.28 0.50 1.00 2.12 1.00	4 41 44 2 2 5 6 1 4 1	2.38	.99985 .99932 .99937 .99997 .99997 .99988 .99987 .99996 .99993 .99998
0721 07211 07212 07213 07214 07215 07216	Coolers, Pumps, Motors Filter Element Gasket Relief Valve Filter Spring Plug Hose, Fittings	372846 372846 372846 372846 372846 372846 372846	17 10 8 1 0 0 68	.046* .027 .021 .003 0.0 .008 .182	6.00 3.90 12.60 0.50 0.0 1.80 40.70	1.50 0.56 2.52 0.50 0.0 0.60 1.31	4 7 5 1 0 0 31	2.38	.99977 .99987 .99989 .99998 1.0000 .99996 .99909

\*See important note on Appendix cover sheet

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Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
0900 Propeller and Shaft Assembly	372846	4	.011*	3.00	1.50	2	2.38	.99994
09001 Bolts	372846	0	0.0	0.0	0.0	0		1.0000
09002 Bearings	372846	3	.008	2.50	0.83	3		.99996
09003 Shaft	372846	3	.008	4.00	2.00	2		.99996
09004 Sprocket	372846	0	0.0	0.0	0.0	0		1.0000
09005 "U" Joint Kit	372846	30	.080	52.00	2.00	26		.99960
09006 "U" Joint Assembly	372846	90	.241	253.50	3.62	70		.99880
1000 Axle and Housing	372846	7	.019*	29.80	4.26	7	2.38	.99990
10001 Shaft	372846	15	.040	26.00	2.60	10		.99980
10002 Housing	372846	0	0.0	0.0	0.0	0		1.0000
10003 Hydra-Lizer	372846	7	.019	12.00	1.71	7		.99990
1002 Differential	372846	26	.070*	54.70	2.38	23	2.38	.99965
10021 Roller Bearing	372846	9	.024	4.50	0.90	5		.99988
10022 Ring Gear/Pinion Teeth	372846	8	.021	4.00	4.00	1		.99989
10023 Spider Gear	372846	2	.005	---	---	0		.99997
10024 Gasket	372846	7	.019	12.00	2.40	5		.99990
10025 Carrier	372846	9	.024	1.50	0.75	2		.99988
10026 Seal	372846	40	.107	52.60	1.70	31		.99947
10027 Cone	372846	7	.019	8.00	4.00	2		.99990
1100 Rear Axle Assembly	372846	12	.032*	19.50	1.77	11	2.38	.99984

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Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
1104 Steering Sideshaft and Wheel Leaning Mechanism	372846	14	.038*	13.20	1.10	12	2.38	.9981
11041 Steering Axle	372846	58	.156	99.80	2.27	44		.9922
11042 King Pin Bearing	372846	13	.035	14.70	1.13	13		.9982
11043 King Pin	372846	35	.094	42.70	1.71	25		.9953
11044 Fitting	372846	16	.043	17.50	1.25	14		.9979
11045 Bushing	372846	137	.367	69.40	1.02	68		.99817
11046 Steering Center Arm	372846	31	.083	55.70	2.32	24		.9959
11047 Cone and Roller	372846	140	.375	49.50	0.66	75		.99813
11048 Roller Bearing	372846	96	.257	54.70	0.99	55		.99872
11049 Cup	372846	117	.314	31.80	0.50	63		.99844
110410 Seal	372846	17	.046	1.80	0.26	7		.99977
1204 Hydraulic Brake System	773891	0	0.0*	0.0	0.0	0	4.94	1.0000
12041 Hydraulic Brake Line	773891	7	.009	3.00	1.00	3		.9996
12042 Gasket	773891	9	.012	5.00	0.71	7		.9994
12043 Wheel Cylinder Boot	773891	55	.071	29.20	0.66	44		.99965
12044 Wheel Cyl. Piston	773891	13	.017	14.50	2.07	7		.99992
12045 Master Cylinder Cup Seal	773891	0	0.0	0.0	0.0	0		1.0000
12046 Master Cylinder Piston	773891	1	.001	0.50	0.50	1		.99999
12047 Master Cylinder Spring	773891	2	.003	4.00	4.00	1		.99998
12048 Hose	773891	1	.001	0.50	0.50	1		.99999
12049 Tank Fitting	773891	73	.094	83.70	1.47	57		.99954
120410 Master Cylinder Assembly	773891	174	.224	160.50	1.24	129		.99889
120411 Wheel Cylinder Kit	773891	31	.040	30.00	1.36	22		.99980
120412 Master Cylinder Kit	773891							

1204 CONTINUED ON NEXT PAGE

\*See important note on Appendix cover sheet



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Component Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/ 10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
120413 120414	Inching Valve Boot Inching Valve Assembly	80679 80679	31 4	.384* .049	13.70 4.50	1.05 1.12	13 4	.525	.99980 .99997
1206 12061 12062 12063 12064	Mechanical Brake Pedal Pad Return Spring Linkage Bearing	773891 773891 773891 773891 773891	11 87 13 12 4	.014* .112 .017 .016 .005	8.00 31.50 7.00 9.90 2.00	0.89 0.38 0.58 0.99 1.00	9 82 12 10 2	4.94	.99993 .99945 .99992 .99992 .99997
1201 12011 12012 12013 12014 12015	Hand Brake Shear Pin Cable and Clamp Lever Knob Shoes/Band	773891 773891 773891 773891 773891 773891	143 0 85 124 4 30	.185* 0.0 .110 .160 .005 .039	191.60 0.0 96.60 110.40 2.00 36.00	1.40 0.0 1.38 1.08 0.67 2.77	137 0 70 102 3 13	4.94	.99909 1.0000 .99946 .99921 .99997 .99981
1202 12021 12022 12023 12024 12025 12026 12027 12028 12029 12030	Service Brake Brake Shoe Retracting Spring Brake Lining Carrier Plate Adjusting Screw Wheel Cylinder Assembly Cable Assembly Seal Creepers/Inching Pedal Clamp	773891 773891 773891 773891 773891 773891 773891 773891 773891 773891 773891 773891	407 592 76 0 4 17 38 119 47 239 8	.526* .765 .098 0.0 .005 .022 .049 .154 .061 2.962 .010	598.70 427.10 38.40 0.0 6.00 4.00 40.50 178.30 26.80 227.60 5.50	1.58 0.90 0.69 0.0 6.00 1.00 1.50 1.77 0.92 0.98 1.37	378 474 56 0 1 4 27 101 29 232 4	4.94	.99740 .99622 .99952 1.0000 .99997 .99989 .99976 .99924 .99970 .99844 .99995

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Functional Group Code	Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
1311	Wheel Assembly	745692	28	.038*	20.50	0.98	21	4.76	.9982
1311	Brake Drum	745692	20	.027	37.00	2.18	17		.9987
1312	Wheel Bearing	745692	36	.048	17.50	0.83	21		.9977
1313	Cup	745692	19	.025	8.80	0.59	15		.9988
1314	Wheel Nuts, Bolts, Lugs	745692	96	.129	84.40	1.08	78		.9939
1315	Seal	745692	49	.066	54.70	1.33	41		.9969
1318	Spring	745692	2	.003	1.00	1.00	1		.9960
13131	Tires	745692	935	1.254*	803.40	1.00	801	4.76	.99405
13132	Tubes	745692	63	.084	50.00	1.22	41		.9960
1401	Mechanical Steering Assembly	372846	170	.456*	166.60	1.02	164	2.38	.99891
14011	Tie Rod and End	372846	154	.413	138.00	1.23	112		.99902
14012	Bearing	372846	59	.158	56.50	1.18	48		.99962
14013	Steering Wheel	372846	29	.078	28.00	1.17	24		.9981
14014	Seal	372846	50	.134	21.20	0.73	29		.99968
14015	Shaft	372846	19	.051	24.00	1.60	15		.99988
14017	Drag Link	372846	100	.268	60.80	0.67	91		.99936
14018	Nuts, Bolts, Etc.	372846	125	.335	46.90	0.85	55		.99920
1410	Hydraulic Pump	372846	157	.421*	286.20	2.07	138	2.38	.99900
14101	Gears	372846	1	.003	---	---	0		.99999
14102	Seal	372846	80	.215	78.20	1.40	56		.99949
14103	Bearing	372846	17	.046	13.20	0.94	14		.99989
14104	Relief Valve	372846	4	.011	3.20	1.07	3		.99997
14105	Gasket	372846	16	.043	10.40	0.69	15		.99990
14106	Drive Belt	372846	253	.679	126.10	0.61	208		.99838
14107	Shaft	372846	3	.008	1.50	0.50	3		.99998
14108		372846	9	.024	4.00	1.00	4		.99994

\*See important note on Appendix cover sheet

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Component Name	Accumulated hours	Number of Failures	Failures/ 10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reporting Manhours	Mission Operating Time (Hours)	Component Reliab.
1411 Hoses, Lines and Fittings	372846	281	.754*	274.60	1.05	262	2.38	.99821
1412 Hydraulic Cylinder	372846	102	.274*	202.40	2.27	89	2.38	.99935
14121 Seal	372846	21	.056	5.30	0.38	14		.99987
14122 Cylinder	372846	4	.011	3.20	0.80	4		.99997
14123 Piston	372846	2	.005	4.20	2.10	2		.99999
14124 Ball Socket	372846	27	.072	15.50	0.86	18		.99983
1414 Steering System	372846	103	.276*	169.40	2.02	84	2.38	.99934
14141 Valves	372846	1	.003	---	---	0		.99999
14142 Spool	372846	17	.046	16.90	1.41	12		.99989
14143 Seal	372846	2	.005	---	---	0		.99999
14144 Dust Cover	372846	1	.003	---	---	0		.99999
14145 Sleeve	372846	46	.123	34.50	0.78	44		.99971
14146 P/S Packing	372846	128	.343	183.30	1.68	109		.99918
1501 Frame Assembly	745692	57	.076*	93.70	1.74	54	4.76	.99964
1502 Counterweight	745692	7	.009*	6.50	1.08	6	4.76	.99996
1601 Leaf Springs	745692	0	0.0*	0.0	0.0	0	4.76	1.0000
1602 Clamps, Nuts, Bolts	745692	37	.050*	8.00	0.50	16	4.76	.99976

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Component Name	Accumulated Hours	Number of Failures	Failures/10 <sup>3</sup> Hrs.	Maint. Manhours	Mean Maint. Manhours	Actions Reported Manhours	Mission Operating Time (Hours)	Component Reliab.
1801 Body Assembly	745692	9	.012*	15.10	1.68	9	4.76	.99994
18011 Hinge	745692	3	.004	2.50	0.83	3		.99998
18012 Latch	745692	10	.013	4.60	0.51	9		.99994
18013 Structure	745692	219	.294	354.50	1.82	195		.99860
18015 Floor Board Assembly	745692	22	.030	8.70	0.43	20		.99986
18062 Seat Back Rest	783290	81	.103*	95.90	1.35	71	5.00	.99948
2401 Hydraulic Lift Pump	372846	105	.282*	166.00	1.80	92	2.38	.99933
24011 Pump Drive Cross Bearings	372846	0	0.0	0.0	0.0	0		1.0000
24012 Pump Bearing	372846	4	.011	1.50	1.50	1		.99997
24013 Seal	372846	47	.126	31.50	1.21	26		.99970
24014 Gear	372846	5	.013	11.00	2.20	5		.99997
24015 Pump Packing	372846	17	.046	33.90	2.26	15		.99989
24016 Hydraulic Pump Filter	372846	74	.198	48.00	0.67	72		.99953
24017 Pulley	372846	6	.016	6.00	1.50	4		.99996
2402 Hydraulic Control Valve	372846	135	.362*	195.20	1.74	112	2.38	.99914
24021 Spring	372846	7	.019	6.50	1.30	5		.99995
24022 Seal	372846	142	.381	112.70	1.27	89		.99909
24023 Piston	372846	3	.008	3.50	1.75	2		.99998
24024 Cap	372846	1	.003	1.50	1.50	1		.99999
24025 Hose	372846	74	.198	85.10	1.20	71		.99953
24026 Bracket	372846	4	.011	3.20	0.80	4		.99997
24027 Valve Cover	372846	1	.003	1.00	1.00	1		.99999
24028 C/V Packing	372846	151	.405	137.00	1.18	116		.99904
24029 C/V Ring Set	372846	35	.094	27.50	1.25	22		.99978

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\*See important note on Appendix cover sheet



Component Name	Accumulated	Days	3	Days	Hours	Days	Hours	Mission Operating Time (Hours)	Component Reliability
2403 Hydraulic Controls									
24031 Levers Linkage	372846	15	.040*	16.80	1.29	13	.99990		
24032 Spring Linkage Pin	372846	10	.027	3.00	1.00	3	.99994		
24033 Level, Link or Rod	372846	2	.005	1.50	0.75	2	.99999		
	372846	20	.054	18.20	1.21	15	.99987		
2404 Hydraulic Tilt Cylinder									
24041 Packing	372846	161	.432*	189.00	1.24	153	.99897		
24042 Tilt Cylinder Assembly	372846	255	.648	258.90	1.18	219	.99846		
24043 Linkage	372846	91	.244	139.60	1.66	84	.99942		
24044 Packing Nut	372846	59	.158	29.80	0.52	57	.99962		
24045 Hose	372846	12	.032	5.60	0.51	11	.99992		
24046 Ring	372846	94	.252	101.70	1.24	82	.99940		
24047 Cup	372846	40	.107	18.70	1.25	15	.99974		
24048 Kit	372846	16	.043	11.00	1.00	11	.999		
		60	.161	74.50	1.66	45	.99962		
2405 Hydraulic Mast Column Assembly									
24051 Packing	745692	61	.082*	61.80	1.05	59	.99961		
24052 Cylinder	745692	669	.897	624.20	1.10	566	.99573		
24053 Roller Bearings	745692	102	.137	201.70	2.22	91	.99935		
24054 Pins	745692	127	.170	93.90	1.22	77	.99919		
24055 Chain	745692	19	.025	10.00	0.71	14	.99988		
24056 Package Rack	745692	80	.107	72.10	1.02	71	.99949		
24057 Ring	745692	136	.182	143.50	1.26	114	.99913		
24058 Inner Slide	745692	119	.160	54.20	0.82	66	.99924		
24059 Brace	745692	41	.055	55.00	1.62	34	.99974		
		9	.012	4.00	0.57	7	.99994		

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Component Name	Accumu- lated	3	Mission Operating	Component
240511 Flange Assembly	745692	1 .001*	1	.99999
240512 Bolt, Clamp	745692	15 .020	15	.99990
240513 Packing Nut	745692	62 .083	59	.99960
240514 Forks	745692	47 .063	41	.99970
2406 Hydraulic Lines and Fittings	745692	38 .051*	31	.99976
24061 Lines	745692	144 .193	115	.99908
24062 Filter Element	745692	55 .074	44	.99965
24063 Filter Gasket	745692	9 .012	7	.99994
24064 Filter Spring	745692	0 0.0	0	1.0000
24065 Hydraulic Fluid Tank	745692	32 .043	26	.99980
2501 Clutch	372846	36 .097*	31	.99977
25011 Pedal	372846	16 .043	16	.99990
25012 Spring	372846	6 .016	5	.99996
25013 Plate Assembly	372846	18 .046	10	.99989
25014 Linkage	372846	9 .024	5	.99994
25015 Disc Assembly	372846	15 .040	8	.99990
25016 Bearings	372846	17 .046	10	.99989

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\*See important note on Appendix cover sheet